Specification

METHOD AND APPARATUS FOR COMPUTER CONTROL

The method and apparatus for computer control presented here is based on a novel use of laser produced speckle light patterns and the Agilent Technologies HDNS-2000 Solid State Optical Mouse Sensor (HDNS-2000) taken in conjunction with voice recognition.

Technical specifications of the HDNS-2000 are reproduced in Appendix 1. The HDNS-2000 works by imaging a patterned surface illuminated by incoherent light onto a 22 x 22 array of photo sensors. The navigational data for cursor positioning is generated by a digital signal processing of the sensor array output as described in US patent 6,233,368 B1, May 15, 2001, Appendix 2. Referring to Figure 1, the principle of the HDNS-2000 chip function can be described as follows. Essentially incoherent illumination from a bright LED illuminates a patterned source in close proximity to the receiving optics and the sensor array. The sensor array images the pattern in finite conjugates. The image is processed by the digital signal processor section to yield x-y position date for the mouse cursor through the usual PC port. The limitations of this art are that the illumination must be significantly intense, the patterned surface must be maintained in the object plane for sharp focusing and there must be substantial motion of the patterned surface to obtain reasonable x-y signal variation. This compels the art to take the form of a large hand held device moving to take the form of a large hand held device moving over substantial space on a selected surface.

1. NOVEL CONCEPT 1-SPECKLE PATTERN CONTROL OF THE HDNS-2000

To overcome these limitations so as to provide new and novel features, the invention modification of Figure 2 is suggested. In this novel arrangement, the imaging lens is eliminated in the conventional sensor as well as any apertures lying in front of the detector array. This permits the detector array to capture a very large angular subtense. In addition, the sensor is illuminated with a speckle

pattern generated by a speckle pattern generating optical generating arrangement, to be described in more detail in the following. The speckle pattern is produced by an essentially coherent light source such as a laser. Motion at the speckle pattern relative to the sensor array produces the desired x-y motion of the mouse cursor. Relative motion of the speckle pattern generating optics can be accomplished by 1) movement of the sensor array relative to a stationary spectacle pattern; 2) movement of the speckle pattern generating optics relative to a stationary sensor array and laser beam; 3) movement of the coherent light source relative to the speckle pattern generating optics; and 4) movement of the combined speckle pattern generating optical arrangement taken in conjunction with the laser relative to the sensor array, and the other combinations. Thus the options for the application of HDNS-2000 have increased multiples. The speckle pattern generating optical arrangement of Figure 2 is discussed in detail in the novel application of the concept to a head movement and to a finger tip controlled mouse. Novel use is made of voice recognition for these two inventive concepts.

2. HEAD MOVEMENT AND VOICE RECOGNITION CONTROLLED MOUSE

The head movement and voice controlled mouse is diagrammed in Figure 3. It is comprised of an HDNS 200 sensor connected to the mouse port of the computer. The sensor has no lens and no aperture in front of the chip. The operator places the headset on his head and controls the cursor position by moving a laser produced cone shaped pattern across the HDNS-2000 sensor. The sensor is connected to the mouse port. The movement of the speckle pattern is translated into cursor movement. A microphone with preferably a wireless transmitter is attached to the headset. Voice commands enter the computer on the microphone input to the computer. Voice recognition's software which is regularly provided by Microsoft in their latest operating system is used to recognize verbal commands such as "open", "press", "drag", "drop" and "click." The speckle pattern can be produced by the methods illustrated in Figure 4. In

(A) the speckle pattern generator is comprised of a solid state laser beamed into the end of a fiber-optic bundle. The multiple refractions and reflections of the beam as it passes through the bundle creates the desired speckle pattern. In (B), a laser is beamed into a specially generated holographic element to produce the desired structured diffractive laser light pattern.

3. FINGER TIP AND VOICE OR BUTTON CONTROLLED MOUSE

This application is illustrated in Figure 5. The speckle pattern is produced by focusing a laser beam onto a finger tip through a supporting glass plate. The focused laser beam generates a speckle pattern that falls on the HDNS-2000 sensor element. A lens may be interposed in this region, in the space between the finger tip and the HDNS-2000 sensor, to enhance the resolution. Motion of the speckle pattern relative to the sensor array is accomplished by moving the finger in two dimensions over the supporting glass surface. The speckle pattern motion is converted into corresponding cursor position changes by mean of the digital signal processor. Mouse button push commands can be fed into the data stream with usual input interfaces. Alternatively, a voice recognition interface can be established as was done for the previously discussed head tracking methods.

A number of embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the invention is not to be limited by specific illustrated embodiment, but only by the scope of the appended claims.

What is claimed is:

1. An apparatus for controlling the position of a cursor marker on a computer monitor screen and selecting the computer action such as on-screen